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May 12, 1992

OEPA-SEDO
2195 Front Street
Logan, OH 43138

Attn: Mr. Michael Nihiser, R.S.

Subj: Jackson Sanitary Landfill

Dear Mike:

Enclosed is the updated Hydrogeologic Investigation Plan.

Our intent is to start drilling and data collection early this summer.

If any questions come up, give me a call.

Respectfully,

Steven Benson
SCB/bjr

CC: Mark Metcalf - DSHWM
Jackson Co. Health Dept.
Paula Cotter - AGO
Dewey Sanderson
Douglas Snyder - DGW - SEDO
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S.B.A. CONSULTANTS, INC.

PROPOSED HYDROGEOLOGICAL INVESTIGATION AND EVALUATION OF THE JACKSON LANDFILL, JACKSON, OHIO

DEWEY D. SANDERSON

APRIL 23, 1992

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INTRODUCTION

It is the intent of this plan to comply with regulation 3745-27 of OEPA effective July 1976 and the portions of the March 1990 updated Regs as follows;
3745-27-11 B, G-3, J, K and L as applicable.

This outline is to serve as a work plan for the investigation of the geological/hydrological study and evaluation of the Jackson Sanitary Landfill site. The outline will serve as a basis of intended work to be conducted and for a basis of dialogue with the Ohio EPA.

OEPA involvement and concurrence as the work progresses will be sought.

The objectives of the study are to:

1) Comply with director's final findings and orders.
2) Define the surface and subsurface earth materials.
3) Determine the subsurface hydrological conditions.
4) Characterize the consolidated and unconsolidated materials as to hydrologic parameters.
5) Provide baseline data on current water quality standards.
6) Make provisions for continued monitoring of the site.
7) Determine the actual preferred leachate pathway.

The data from the realization of the above objectives will assess the quality, quantity, and distribution of soil cover available (on site or adjacent) to be used as cap material for the existing landfill and thereby maintain compliance with the current regulatory standards to insure a minimum impact of this landfill site on the environment, both on a short and long term basis.

Also addressed will be current groundwater quality and impact of the landfill, and allow for long term water quality monitoring.

INTRODUCTION

In 1970 the State of Ohio Department of Health approved the opening of the, then named, Jenkins Landfill. The site continued to operate under the name of the Jackson Landfill until 1987 at which time it closed and has received no further waste materials.

The site is located at 1861 Smith Bridge Road (County Road 60) on the northwest side of Jackson, Ohio. The township/range location of the landfill is T7N, R19W, Section 13, SE1/4. The landfill is sited in an abandoned strip mine and covers approximately 23 acres.

In 1986, an application was made to the Ohio EPA to expand the boundaries of the original site plan. The expansion required a limited hydrogeologic investigation of the site by Burgess and Niple, Ltd. of Columbus, Ohio. No hydrogeologic investigation was required at the time the landfill commenced operations nor has any study been conducted since it closure.

PHYSIOGRAPHIC SETTING

The Jackson Landfill is in an unglaciated part of the Appalachian Plateau of south-central Ohio. The moderately rolling topography ranges in elevation from 600-800 feet, this being about 200 feet of relief.

Little Salt Creek, the main drainage in the vicinity, lies within a few hundred feet west of the landfill at an elevation of approximately 630 feet. A steep slope separates the area of the landfill, which is about 80 feet higher, from the river valley of Little Salt Creek. Surface drainage from the landfill and the immediate area feed into the North flowing Little Salt Creek.

REGIONAL GEOLOGY

Strata of the upper Mississippian and lower Pennsylvanian Periods underlie the area. These sedimentary rocks are gently tilted to the east. Since this part of Ohio has not been glaciated, soils have developed on alluvium in the valleys and bedrock in the uplands.

The rocks are primarily composed of interbedded sandstones, shales, siltstones and two coal seams, the Sharon and Quakertown. Coal was stripped from this site and the former strip bench served as the site for waste disposal. Long ago, coal was mined underground near this site.

This proposal outlines the work to be carried out to characterize the geologic and hydrologic conditions of the site. Such a study was not required when the landfill was opened in 1970. There will be an ongoing program to monitor the groundwater and surface conditions of the site.

GROUNDWATER USAGE

Regulations require that an inventory be made of all water wells within 2000 feet of the landfill. The ODNR Division of Water has records that are available for review to locate water wells, if any, within the potential area of influence of the site. The Jackson Water Company may now service residents in the immediate area of the landfill who were not served by the utility when the Burgess and Niple study was conducted in 1986. The records and applications of this utility will be reviewed. A door-to-door survey of water utility source is not considered advisable for the undo concern it could cause.

MINING ACTIVITY

The USGS topographic map of Jackson, Ohio shows a number of strip mines within a few miles of the landfill. As previously referred to, the site is in an abandoned strip mine. The original site topographic map shows the pre-fill surface. From the superposition of the current site topographic map over the original map and delineated by the extent of the fill limit, a determination of the site fill volume will be made.

The State of Ohio Division of Mines and Geological Survey will be contacted to determine additional mining activity that is occurring or may have occurred in the vicinity. The Geological Survey and the Department of Natural Resources will have records of gas/oil drilling activity.

FIELDWORK

1) Test borings - Approximately sixteen (16) test holes are proposed on the landfill site property distributed about the perimeter of the site. These will be spaced at 300 foot centers and be about 50 feet from the toe of waste. Additional holes will be field located at possible borrow sites. The locations of these holes will be based on three criteria:

   a) Avoid drilling through areas already covered by waste materials but be within 50 feet of the toe of waste. A backhoe has been used to locate the toe of fill. Bore sites will generally be immediately adjacent to the trench sites.
   b) To give uniform coverage of the underlying geology.
   c) Provide lines that will serve as good transects for cross sections.

The main effort of the investigation will be directed to the subsurface. However, a surface reconnaissance of the site will be undertaken to locate any natural spring or seeps.

The locations of the holes are shown on the accompanying site map and were spotted based on field reconnaissance of the site. Holes will be rotary drilled at spacings of approximately 300 feet where possible. Deviation of the 300 foot spacing may be necessary along the northwest side of the fill due to the very steep slope.

Elevations along the fill boundary range from 710-765 feet. The four Burgess and Niple test holes of 1986 bottomed at nearly a 720 feet elevation. The holes of this drilling program will be to lower elevations than previously drilled, though the holes will not likely be to a depth greater than 80-120 feet. They will be drilled through the first aquifer as required. Split spoon samples will be collected, marked and saved. Soil and rock samples will be appropriately retained for laboratory analysis and identification.

Continuous samples will be taken, split spoon in the soil zone and core in the lithologic section. Soil samples will be collected in glass jars and rock core will be stored in

standard core boxes. Shelby tube samples will be collected from representative soils and sealed for laboratory analysis at a later time.

The rock and soil samples will be identified in the laboratory. Soil samples will be analyzed for their grain size content and classified by the USES scheme. Hydraulic conductivity measurements will be made on representative rock and soil units.

2) Test pits - No pits are planned but if needed, a backhoe will be used to excavate test pits in the soil zone to determine its structure, layering, composition and thickness about the property. Representative samples, disturbed (collected in glass jars) and undisturbed (Shelby tubes), will be taken from each significant soil zone.

3) Monitoring wells - Following the drilling operation, selected test holes will be converted to piezometers to be used for monitoring water levels and collecting water samples. At this time it is planned that the sixteen holes around the perimeter of the fill will be used as monitoring wells.

   The installed piezometers will be constructed of 2 inch diameter PVC, flush joint threaded, and fitted with a 10 foot section of slotted PVC well screen at the bottom. A sand pack about the well screen will be sealed with bentonite pellets and bentonite slurry to the surface. The piezometers will be secured with protective caps.

   Before and after the installation of the piezometers, the well bores will be flushed, bailed and blown out with clean water. The piezometer installation will be done to prevent contamination so that later chemical tests will not be invalid.

   Ohio EPA, SEDO, shall be given written notification of the date for installation of the monitor wells. Notification shall be given at least seven days prior to installation.

All monitoring wells shall be designed, installed, and developed in a manner that allows the collection of ground-water samples that are representative of ground-water quality in the geologic unit being monitored. At a minimum:

(a) Monitoring wells shall be cased in a manner that maintains the integrity of the monitoring well boreholes; and

(b) The annular space (I.E., the space between the borehole and the well casing) above the sampling depth shall be sealed to prevent the contamination of the samples and the ground water; and

(c) The casing shall be screened or perforated and surrounded by sand or gravel in such a way that it allows:

(i) For the minimization of the passage of formation materials into the well; and

(ii) For the monitoring of discrete portions of the uppermost aquifer system or any significant zones of saturation above the uppermost aquifer system; and

(d) The design, installation, development, and abandonment of any monitoring wells, piezometers, and other measurement, sampling, and analytical devices shall be documented; and

(e) The monitoring wells, piezometers, and other measurement, sampling, and analytical devices shall be operated and maintained to perform to design specifications throughout the life of the monitoring program.

The number, spacing, and depth of ground-water monitoring wells shall be:

(f) Based on site specific hydrogeologic information; and

(g) Capable of detecting a release from the sanitary landfill facility to the ground water at the closest practicable location to the limits of solid waste placement.

(h) The ground-water monitoring program shall include: Consistent sampling and analysis procedures that are protective of human health and the environment and that are designed to ensure monitoring results that provide an accurate representation of ground-water quality at the background and downgradient wells installed. Sampling and analysis procedures employed in the ground-water monitoring program shall be documented in a written plan which shall be available for inspection. This plan shall, at a minimum, include a detailed description of the equipment, procedures, and techniques to be used for:

(i) Measurement of ground-water elevations; and
(j) Detection of immiscible layers; and
(k) Collection of ground-water samples, including:

(i) Well evacuation; and
(ii) Sample withdrawal; and
(iii) Sample containers and handling; and
(iv) Sample preservation; and

(l) Performance of field analysis, including:

(i) Procedures and forms for recording raw data and the exact location, time, and facility-specific conditions associated with the data acquisition; and
(ii) Calibration of field devices; and

(m) Decontamination of equipment; and

(n) Analysis of ground-water samples; and

(o) Chain of custody control, including:

(i) Standardized field tracking reporting forms to record sample custody in the field prior to and during shipment; and

(ii) Sample labels containing all information necessary for effective sample tracking; and

(p) Field and laboratory quality assurance and quality control, including:

(i) Collection of replicate samples; and
(ii) Submission of field-bias blanks; and
(iii) Potential interferences.

TESTING

Both field and laboratory tests will carried out in the closure procedure. Water levels will be measured with a continuity meter. This will be done as soon as the water levels have stabilized after the completion of the piezometers. Slug testing is recommended to determine the in situ hydraulic conductivity characteristics of the aquifer. This method allows for the influence of joints and fractures. Water samples will be withdrawn from selected wells for chemical analysis of constituents as required. On-site determinations of temperature and pH will be made. The samples will appropriately documented, labeled and stored for transport and delivered to a testing laboratory accompanied by a chain of custody form.

Selected monitoring wells shall be sampled as required by regulations. The location and number of wells retained for long term sampling will be as agreed upon with OEPA. All data shall be submitted to the Ohio EPA Southeast District Office, (SEDO) within fourteen (14) days after sample analysis is complete.

The list of sampling parameters wil be actually required by the applicable regulations.

Ground-water elevations shall be measured in each well immediately prior to purging and sampling. The tests shall determine, for the uppermost aquifer system and for all significant zones of saturation monitored, the direction of ground-water flow each time ground-water elevation measurements are performed.

The tests shall determine whether or not there is a statistically significant increase (or decrease in the case or pH) from background values for each parameter or constituent required in the particular ground-water monitoring program that applies to the sanitary landfill facility.

(1) Testing shall determine the concentration or value of the following parameters in ground water;

(a) Temperature; and

(b) pH; and

(c) Specific Conductance; and

(d) Total organic carbon; and

(e) Total dissolved solid; and

(f) Chemical oxygen demand; and

(g) Total alkalinity; and

(h) Ammonia; and

(i) Nitrate-Nitrite; and

(j) Chloride; and

(k) Sodium; and

(l) Sulfate; and

(m) magnesium; and

(n) Calcium; and

(o) Potassium; and

(p) Phosphorus, and

(q) Phenols; and

(r) Cyanide; and

(s) Turbidity; and

(t) Zinc; and

(u) Copper; and

(v) Nickel; and

(w) Barium; and

(y) Chromium; and

(z) Lead; and

(aa) Mercury; and

(bb) Selenium; and

(cc) silver; and

(dd) Iron; and

(ee) Manganese; and

(ff) Arsenic; and

(gg) The volatile organic compounds (vocs) listed in appendix I of rule 3745-27-10

2) Groundwater occurrence and samples - Perched and permanent water zones will be recorded during the drilling of the test holes. Stabilized water level depths shall be recorded and samples taken for chemical analysis.

3) SOIL AND ROCK ANALYSIS

Soil and rock samples will be submitted to a commercial laboratory(ies) for analyses. The following tests will be performed:

a) Soil samples
   i) grain size analysis
   ii) USCS typing
   iii) Proctor test
   iv) permeabilities

b) Rock core
   i) permeabilities
   ii) depth, lithology (physical character), and hydrologic characteristics of the bedrock formations encountered during the boring operations and/or which crop out on or adjacent to the site.
   iii) Geologist logs of soil and rock core

RESOURCE INFORMATION

Besides the information gathered in the field, additional resource data will be acquired through the sources listed below.

1) ODNR-Geological Survey
   a) geological reports
   b) abandoned mine maps
   c) oil and gas record files
   d) stratigraphic data

2) ODNR-Water Division
   a) water well record file

3) ODNR-Division of Mines
   a) active mines

4) Jackson County
   a) check with county offices for surface and subsurface data on immediate area.

5) Computer search of geological literature
   a) journal articles
   b) thesis and dissertations

REPORT OUTLINE

The final report will include applicable data from previous studies along with all newly generated information.

1) Introduction

2) Regional setting
   a) geology
      (i) the structural geology, including a description of local and regional structural features; and
      (ii) A description of the regional geomorphology, including the location of surface water bodies, floodways, etc. This description shall include an analysis of any topographic features that may influence the ground-water flow system; and
   b) groundwater
      (i) the identification of the regional aquifer (s); and
      (ii) the well logs of public and private water supply wells within 2000 ft of the proposed sanitary landfill facility; and
      (iii) the average yield of water supply wells within 2000 ft. of the sanitary landfill facility; and
      (iv) the direction of ground-water flow in the regional aquifer(s); and
      (v) the identification of recharge and discharge areas of the regional aquifer(s); and

3) Local Setting of Site
   a) surface water
   b) drainage
   c) topography

4) Cultural Activity
   a) groundwater
   b) oil & gas
   c) mining
   d) habitation

5) Site Investigation
   a) test holes and results
      (i) geologic stratigraphy and significant zones of saturation corresponding to site boring information, and
      (ii) the uppermost aquifer and all saturated strata above the uppermost aquifer; and
      (iii) all well logs of the borings intercepted by the cross section; and
   b) groundwater occurrence
      (i) ground water flow patterns for the uppermost aquifer and all significant zones of saturation above the uppermost aquifer; and
      (ii) any permanent ground-water control structures; and
   c) slug tests

6) Laboratory Analyses
   a) soils
   b) rock cores
   c) groundwater

7) Conclusions

8) References Cited

9) Appendices (or in main body of report)
   a) tables
      generalized stratigraphic section
      water well logs
      water levels
      soil and rock logs
      groundwater chemical analyses
      hydraulic conductivities (permeabilities)
   b) maps and figures
      vicinity map
      pre-fill site map
      post-fill site map
      piezometer construction
      test hole/piezometer locations
      surface drainage flow patterns
      hydraulic head surface map with flow pattern
      geologic cross sections

PROPOSED GROUNDWATER ASSESSMENT

JACKSON SANITARY LANDFILL, JACKSON COUNTY, OHIO

This document is an addendum to the plan dated October 16, 1987 submitted by Burgess & Niple, Ltd titled "Response to Order No. 3 and No. 6 of the Director of the Ohio Environmental Protection Agency".

This addendum outlines the initiation of a more involved groundwater assessment to comply with DFFO # 3.

This outline is to serve as a work plan for the investigation of the geological/hydrological study and evaluation of the Jackson Sanitary Landfill site. The outline will serve as a basis of intended work to be conducted and for a basis of dialogue with the Ohio EPA.

OEPA involvement & concurrent as the work progresses will be sought.

The objectives of the study are to:

1) Comply with director's final findings and order #3.
2) Define the surface and subsurface earth materials.
3) Determine the subsurface hydrological conditions.
4) Characterize the consolidated and unconsolidated materials as to hydrologic parameters.
5) Provide baseline data on current water quality standards.
6) Make provisions for continued monitoring of the site.
7) Determine the actual preferred leachate pathway.

The data from the realization of the above objectives will assess the quality, quantity, and distribution of soil cover available (on site or adjacent) to be used as cap material for the existing landfill and thereby maintain compliance with the current regulatory standards to insure a minimum impact of this landfill site on the environment, both on a short and long term basis.

Also addressed will be current groundwater quality and impact of the landfill, and allow for longterm water quality monitoring.

The following is proposed:

A) Fieldwork

1) Test borings - Approximately sixteen (16) test holes are proposed on the landfill site property distributed about the perimeter of the site. These will be spaced at 300 foot centers and be about 50 feet from the toe of waste. Additional holes will be field located at possible borrow sites. The locations of these holes will be based on three criteria:

   a) Avoid drilling through areas already covered by waste materials but be within 50 feet of the toe of waste. A backhoe will be utilized to locate the toe of fill before final bore locations are selected.
   b) To give uniform coverage of the underlying geology.
   c) Provide lines that will serve as good transects for cross sections.

   The depths of the holes will be dictated by the following criteria:

   Through the upper most water bearing zone bottoming in the underlying impermeable lithology.

   Continuous samples will be taken, split spoon in the soil zone and core in the lithologic section. Soil samples will be collected in glass jars and rock core will be stored in standard core boxes. Shelby tube samples will be collected from representative soils and sealed for laboratory analysis at a later time.

2) Test pits - No pits are planned but if needed, a backhoe will be used to excavate test pits in the soil zone to determine its structure, layering, composition and thickness about the property. Representative samples, disturbed (collected in glass jars) and undisturbed (Shelby tubes), will be taken from each significant soil zone.

3) Monitoring wells - All of the holes will be backfilled with the bentonite/cement slurry as required except those holes that are deemed necessary for monitoring wells. At this time it is planned that the sixteen

holes around the perimeter of the fill will be used as monitoring wells. Their construction, development, and testing will follow accepted standards.

Monitoring wells will extend to the first water bearing zone beneath the landfill.

Ohio EPA, SEDO, shall be given written notification of the date for installation of the monitor wells. Notification shall be given at least seven days prior to installation.

All monitoring wells shall be sampled quarterly for two years, then semi-annually for the remainder of the post closure period. All data shall be submitted to the Ohio EPA Southeast District Office, (SEDO) within fourteen (14) days after sample analysis is complete.

The anticipated list of sampling parameter is as follows;

Ammonia Nitrogen
Biochemical Oxygen Demand
Chemical Oxygen Demand
Chloride
Iron
Managanese
Phenols
Sodium
Specific Conductance
Total Dissolved Solids
pH
Toe
Arsenic
Barium
Cadmium
Chromuim
Lead
Selenium
Nitrate

4) Groundwater occurrence and samples - Perched and permanent water zones will be recorded during the drilling of the test holes. Stabilized water level depths shall be recorded and samples taken for chemical analysis.

5) Vicinity wells - The occurrence of oil and gas and water wells within a half mile distance of the property will be undertaken by a door-to-door survey as well as by searching state office records.

B) Resource Information

Besides the information gathered in the field, additional resource data will be acquired through the sources listed below.

1) ODNR-Geological Survey
   a) geological reports
   b) abandoned mine maps
   c) oil and gas record files
   d) stratigraphic data

2) ODNR-Water Division
   a) water well record file

3) ODNR-Division of Mines
   a) active mines

4) Jackson County
   a) check with county offices for surface and subsurface data on immediate area.

5) Computer search of geological literature
   a) journal articles
   b) thesis and dissertations

C) Laboratory Analysis

Soil, rock and water samples will be submitted to a commercial laboratory(ies) for analyses. The following tests will be performed:

1) Soil samples
   a) grain size analysis
   b) Atterberg limits
   c) USCS typing
   d) Proctor tests e) permeabilities

2) Rock core
   a) permeabilities

3) Water samples
   a) PH and conductivity
   b) chemical constituents as required

4) Geologist log of soil and rock core

D) Report

The final report will include applicable data from previous studies along with all newly generated information.

1) Introduction

2) Regional setting
   a) geology
   b) groundwater

3) Local Setting of Site
   a) surface water
   b) drainage
   c) topography

4) Cultural Activity
   a) groundwater
   b) oil & gas
   c) mining
   d) habitation

5) Site Investigation
   a) test holes and results
   b) test pits and results
   c) groundwater occurrence

6) Laboratory Analyses
   a) soils
   b) rock cores
   c) groundwater

7) Conclusions

8) References Cited

9) Appendices